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Two new species of cyphelloid fungi (*Basidiomycota*) from China

Yu-Lian Wei* & Wen-Min Qin

weiyulianer@hotmail.com
Institute of Applied Ecology, Chinese Academy of Sciences
Shenyang 110016, China

Abstract — Two new species with cyphelloid morphology were reported from China. *Henningsomyces subiculatus* is distinguished from other species of *Henningsomyces* by having a subiculum. *Cyphellopsis changbaiensis,* characterized by ferruginous clavate pilei, a secondary pileus developed from the interior of the primary one and radially arranged pilei hyphae, resembles *C. anomala* except for smaller basidiospores and lack of a subiculum. A diagnostic key to all known species in *Cyphellopsis* was provided.

Key words — basidiomycete, taxonomy, wood-inhabiting fungi

Introduction

Cyphelloid fungi refer to species that produce cup-, bowl- or tube-shaped basidiocarps. They belong to the homobasidiomycetes and have been grouped in the artificial family "*Cyphellaceae*", which probably is polyphyletic (Agerer 1986, Bodensteiner et al., 2004, Donk 1951, 1959, 1962, 1971, Singer 1986). The well known genera of cyphelloid fungi include *Amyloflagellula* Singer, *Calathella* D.A. Reid, *Calyptella* Quél., *Cyphellopsis* Donk, *Flagelloscypha* Donk, *Halocyphina* Kohlm. & E. Kohlm., *Henningsomyces* Kuntze, *Lachnella* Fr., *Merismodes* Earle, *Pellidiscus* Donk, *Phaeocyphellopsis* W.B. Cooke, *Phaeosolenia* Speg., *Plicaturopsis* D.A. Reid, *Rectipilus* Agerer, *Stigmatolemma* Kalchbr., *Stromatocyphella* W.B. Cooke, and *Woldmaria* W.B. Cooke.

Extensive investigation on Chinese wood-inhabiting fungi has been carried out and many new species have been described (Cui et al. 2008, Dai & Cui 2005, 2006, Dai et al. 2003, 2004, 2007, 2008, Dai & Penttilä 2006, Dai & Wu 2004, Dai & Yang 2008, Li et al. 2007, 2008, Yuan & Dai 2005, 2008). However, only few cyphelloid fungi have been reported.

During studies on the Chinese wood-inhabiting fungi, some fungi with cup- or tube-shaped hymenophores were collected, among which two undescribed species of *Henningsomyces* and *Cyphellopsis* were identified, described here as *Henningsomyces subiculatus* and *Cyphellopsis changbaiensis*.

Materials and methods

The microscopic routine used in the study followed Yuan (2009). In the text the following abbreviations are used: L = mean spore length (arithmetical average of all spores), W = mean spore width (arithmetical average of all spores), Q = quotient of the mean spore length and width (L/W ratio). Sections were studied at magnification up to × 1000 with a Nikon E 80i microscope and phase contrast illumination. Drawings were made with the aid of a drawing tube.

Taxonomy

Henningsomyces subiculatus Y.L. Wei & W.M. Qin, **sp. nov.** Fig. 1

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Carpophorum annuum, facies pororum niveum. Tubulum, up to 300 µm in longitudum, gregariae; pori rotundi, 100 µm in diam; subiculum praesens. Systema hypharum monomiticum, hyphae generatoriae fibulatae vel sine fibulis, hyphae trama 2–4.8 µm in diam, hyphae subiculum 1.9–2.1 µm in diam. Basidiosporae subglobosae, hyalinae, 4.8–5.7 × 4.3–5.1 µm.

Type — **China**. Guangxi Autonomous Region, Longsheng County, Wenquan Forest Park, on fallen angiosperm trunk, 9.VIII.2005 *Dai 6889* (**holotype** in IFP).

Etymology — *subiculatus* (Lat.): referring to the subiculum present in fruitbody.

Fruitbody — Basidiocarps annual, soft when fresh, becoming a little chalky upon drying, white, no odour or taste when fresh, becoming pinkish buff after bruised and drying, occupying an area up to 6 cm long and 5 cm wide on substrate, small tubes densely aggregated. Tubes up to 300 µm long, the tube opening about 100 µm in diam., dissepiments thick, 30–40 µm. Subiculum present, brownish when dry, about 100 µm thick.

Hyphal structure — Hyphal system monomitic, hyphae bearing both clamp connections and simple septa, dextrinoid in Melzer's reagent and cyanophilous in Cotton Blue, hyphae broken in 5% KOH.

Subiculum — Hyphae hyaline, smooth, thick-walled with a wide lumen; bearing clamp connections, rarely branched, interwoven, 1.9–2.1 µm in diam.

Tubes — Hyphae hyaline, smooth, thin-walled; bearing both clamp connections and simple septa, rarely branched, winding, more or less parallel along the tubes, 2–4.8 µm in diam. Cystidia absent. Basidia broadly clavate, with four sterigmata and a basal clamp connection, dissolved in 5% KOH, 10–14 × 7–9.5 µm. Hyphae at tube-mouth (dissepimental edge) finely branched, dendrohyphidia alike.

Spores — Basidiospores subglobose, hyaline, thin-walled, smooth, usually bearing a guttule, acyanophilous, inamyloid and non-dextrinoid, (3.9–)4.8–5.7(–6) × (3.9–)4.3–5.1(–5.5) µm, L = 5.17 µm, W = 4.82 µm, Q = 1.07–1.08 (n = 56/2).

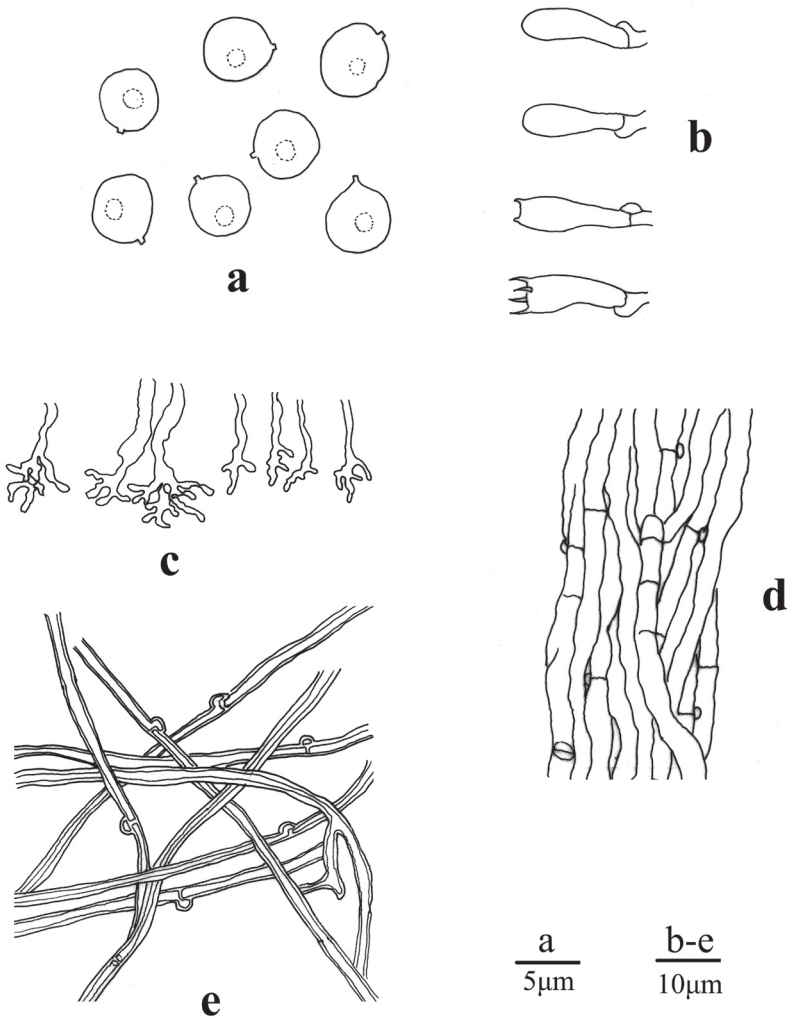

Fig. 1. Microscopic structures of *Henningsomyces subiculatus* (drawn from the holotype). —a: Basidiospores. —b: Basidia and basidioles. —c: Hyphae from tube-mouth (dissepimental edge). —d: Hyphae from tube. —e: Hyphae from subiculum.

Additional specimen (paratype) examined — **China**. Hainan Province, Baoting County, Qixianling Forest Park, on rotten angiosperm wood, 28.V.2008 *Dai 9756* (IFP).

Comments — The presence of a subiculum separates *Henningsomyces subiculatus* from other species of the genus (Agerer 1973, Gilbertson et al. 2001).

Two species of *Henningsomyces, H. candidus* (Pers.) Kuntze and *H. leptus* Y.L. Wei & Y.C. Dai, have been previously reported from China (Wei & Dai 2007, Wei et al. 2007). They have spores similar to those in *H. subiculatus*. However besides having the subiculum, *H. subiculatus* differs from the other two Chinese species in tube length: the tubes of *H. subiculatus* are shorter (less than 0.3 mm), while they are 0.5–1 mm long in *H. candidus* (Breitenbach 1986) and up to 1.8 mm long in *H. leptus* (Wei & Dai 2007).

Cyphellopsis changbaiensis Y.L. Wei & W.M. Qin, **sp. nov.** Fig. 2

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Carpophorum annuum, facies pororum ferruginum; pori rotundi, 200–400 μm in diam. Subiculum nullum. Systema hypharum dimiticum, hyphae generatoriae fibulatae, 1.8–2 μm in diam, hyphae skeletales crassitunicatae, enctrustata, 3–3.8 μm in diam. Basidiosporae ellipsoideae, hyalinae, crassitunicatae, 5.2–6.2 × 3.5–4.2 μm.

Type — **China**. Jilin Prov., Antu County, Changbaishan Nature Reserve, on fallen trunk of *Quercus*, 15.VII.2007 *Dai 8281* (**holotype** in IFP).

Etymology — *changbaiensis:* referring to the mountain of Changbai in Jilin Province, NE China.

Fruitbody — Basidiocarps annual, ferruginous when fresh, effused, forming an area up to 10 cm across, coriaceus, becoming hard fragile upon drying, consisting of small crowded ferruginous pilei (tube-alike) which confluent, pyriform, unceolate, or long clavate, mouths 200–400 μm in diam., tube margin inrolled, outer surface with radial striae, velutinate. A second pileus developed from the interior of an older one, the whole length of pilei up to 1 mm. Subiculum absent.

Hyphal structure — Hyphal system dimitic; generative hyphae bearing clamp connections; all hyphae negative both in Melzer's reagent and Cotton Blue; tissues unchanged in KOH.

Tubes — Generative hyphae scanty, hyaline, thin-walled, smooth, occasionally branched, interwoven, 1.8–2 μm; skeletal hyphae dominant, thick-walled with a narrow lumen to almost solid, red-brown, finely encrusted and hamate, unbranched, 3–3.8 μm in diam. Cystidia absent. Basidia clavate, with four sterigmata and a basal clamp connection, 17–24 × 4.8–5.1 μm.

Spores — Basidiospores ellipsoid, hyaline, thick-walled, smooth, slightly cyanophilous, inamyloid and non-dextrinoid, (5–)5.2–6.2(–6.3) × (3–)3.5–4.2(–4.3) μm, L = 5.73 μm, W = 3.95 μm, Q = 1.45 (n = 32/1).

Comments — The ferruginous basidiocarps of the new species resemble those of *Cyphellopsis anomala* (Pers.) Donk; both species also develop a secondary pileus from the interior of an older one. However, *C. anomala* differs from *C. changbaiensis* by having larger basidiospores (8–11 × 5–6.5 μm) and a subiculum (Cunningham 1963).

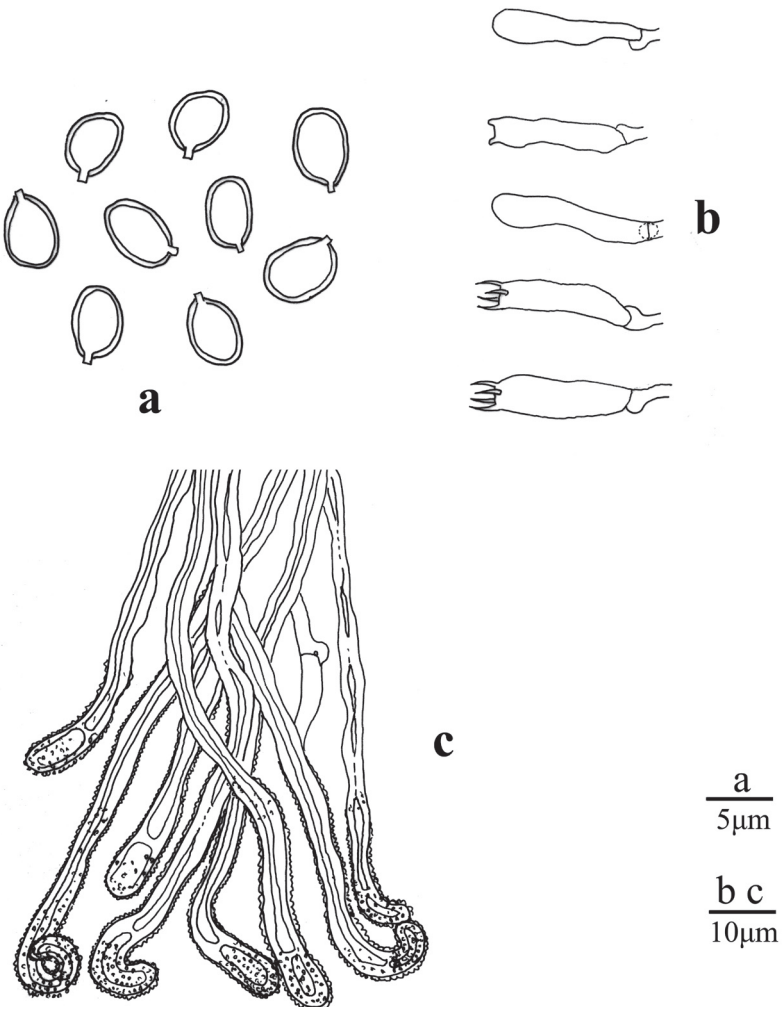

Fig. 2. Microscopic structures of *Cyphellopsis changbaiensis* (drawn from the holotype). —a: Basidiospores. —b: Basidia and basidioles. —c: Hyphae from tube.

Donk based the genus *Cyphellopsis* on *C. anomala* (Donk 1931). In addition to *C. changbaiensis* and *C. anomala,* seven other *Cyphellopsis* species are currently recognized: *C. alboviolascens* (Alb. & Schwein.) Donk, *C. confusa* D.A. Reid, *C. maxima* (Massee) Donk, *C. mellea* (Burt) D.A. Reid, *C. monacha* (Speg.) D.A. Reid, *C. subglobispora* D.A. Reid, and *C. volkensii* (Henn.) Singer (Donk 1931; Reid 1961, 1963, 1964; Singer 1973). A key to these species is provided

below. [NOTE: The features for *C. volkensii* (basionym = *Cyphella variolosa* var. *volkensii* Kalchbr. & Henn.) are based primarily the description of *Cyphella variolosa* Kalchbr. by Cooke (1962).]

Key to *Cyphellopsis* species

1. Pilei large, ~12 mm in diam. ..... *C. maxima*
1. Pilei smaller, ≤ 10 mm in diam. 2
2. Basidiospores colored 3
2. Basidiospores hyaline 4
3. Basidiospores at first hyaline, becoming brown (6-8 × 3-3.5 μm) ..... *C. mellea*
3. Basidiospores brown from the first ..... *C. volkensii*
4. Basidiospore wall thick 5
4. Basidiospore wall relatively thin 7
5. Pileus disciform or pezizaeform, spore length > 11 μm (12-17 × 9-11μm) ..... *C. alboviolascens*
5. Pileus pyriform, spore length < 11 μm 6
6. Basidiospores oblong-ellipsoid, bigger, (8-11 × 5-6.5 μm) ..... *C. anomala*
6. Basidiospores ellipsoid, smaller (5.2–6.2 × 3.5–4.2 μm) ..... *C. changbaiensis*
7. Basidiospore length > 9 μm (10-13.75 × 5.75-7.2 μm) ..... *C. monacha*
7. Basidiospore length < 9 μm 8
8. Pileus cushion-shaped, 1.5-3.5 mm in diam.; basidiospores 7-8.2 × 2-2.2 μm ..... *C. confusa*
8. Pileus subglobular or turbinate, 0.15-0.2 mm high, 0.13-0.15 mm wide; basidiospores 7-8.75 × 5-6.5 μm ..... *C. subglobispora*

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